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(54) Method of making protruding end stops for a plastic reclosable fastener.

(57) A method of making an end stop for a slider of a fastener structure for a thermoplastic bag. The fastener structure comprises a pair of flexible plastic strips adapted to be connected to the walls of the bag (B) and having reclosable interlocking male and female profile elements (16,17) on the respective strips (14,15) and a slider (10) straddling the strips for opening and closing them. The method comprises clamping together a pair of the flexible plastic strips between clamps (40,41) at a seal area in the region intended to form an end of the strips, the clamps (40a,40b) having pockets (41a,41b) therein adjacent the profile elements at the seal area. The profile elements are severed and heated at the seal area with a heated knife (45) to transform the severed ends of the profile elements into molten material; the molten material is pressed into the pockets in the clamps (40,41) with the heated knife (45) thereby increasing the thickness of an area of the strips adjacent the seal area to provide a protruding end stop for preventing movement of the slider past the ends of the bag (30).

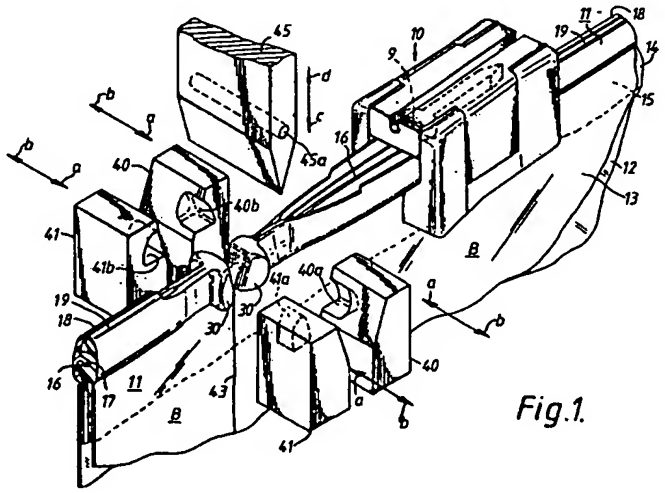

Fig.1.

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The present invention relates to a method of forming end stops for a fastener structure.

Plastic reclosable fasteners or zippers with sliders are well known in the art. The plastic zippers have profiles and include a pair of male and female fastener elements in the form of reclosable interlocking rib and groove elements with a slider for opening and closing the rib and groove elements. In the manufacture of thermoplastic film bags, a pair of these male and female fastener elements extend along the mouth of the bag and these male and female elements are adapted to be secured in any suitable manner to the flexible walls of the thermoplastic film bags. These elements may be integral marginal portions of such walls or they may be extruded separately and thereafter attached to the walls along the mouth of the bag.

Various arrangements have been utilized heretofore to maintain the slider on the zipper. In one of the more conventional arrangements the slider includes a separator finger that extends down between the integral locking rib end groove elements as the slider is moved from one edge of the bag to the other edge of the bag. When the bag is opened, the only thing to stop the slider was the side seam at the edge of the bag when the slider finger comes into contact with it. This prior art is described in US-A-3790992.

In that patent there is disclosed an improvement wherein the heat seals that join the rib and groove elements are wider at one end than the second edge of the bag and the wider seal being of a width at least equal to the length of the slider from its closing end to the finger so that the slider will remain fully on the bag at the end of its travel when opening the bag. The patent points out that these seal areas provide stops for the slider.

Another arrangement for providing stops at the end of the zipper is disclosed in US-A-3259951. In that patent the opposite ends of the interlocking or mating strips are permanently joined or sealed to each other at the ends with stop members sealed between the opposite ends of these members to stop the longitudinal movement of the slider thereallong.

It would be desirable to provide a plastic bag having a zipper that is operated by a slider wherein the zipper is terminated with protruding end stops formed from the zipper to prevent the slider from moving off past the ends of the zipper. With this arrangement it is not necessary to add an additional stop element to the zipper nor to rely on the strength of the seam at the edge of the bag for preventing the slider from moving past the ends of the bag. It would also be desirable to do this by a method that does not slow down the manufacturing process. It is an object of the present invention to provide an improved method for making an end termination for a zipper which incorporates a stop for the slider by severing the plastic zipper profile with a hot knife and forcing the melted plastic into cavities forming the end stops. According to the present invention there is provided a method of making an end stop for a slider of a fastener structure for a thermoplastic bag comprising a pair of flexible plastic strips adapted to be connected to the walls of the bag and having reclosable interlocking male and female profile elements on the respective strips and a slider straddling the strips for opening and closing the fastener said strips,

said method comprising:

clamping together a pair of the flexible plastic strips between clamps at a seal area in the region intended to form an end of the strips, the clamps having pockets therein adjacent the profile elements at the seal area;

severing and heating the profile elements at the seal area with a heated knife to transform the severed ends of the profile elements into molten material and pressing the molten material into the pockets in the clamps with the heated knife thereby increasing the thickness of an area of the strips adjacent the seal area to provide a protruding end stop for preventing movement of the slider past the ends of the bag.

Preferably the pair of flexible plastic strips is clamped between at least one pair of clamps: preferably the pair of flexible strips is clamped between two pairs of clamps.

Desirably the heated knife is moved transversely to the axis of the strips in severing the profile elements.

In one embodiment the heated knife has at least one inclined surface for pressing the molten material into the pockets in the clamps. Preferably the heated knife has two inclined surfaces for pressing the molten material into the pockets in each of the clamps concurrently to form adjacent end stops.

In another embodiment, after said transverse movement the heated knife is moved parallel to the axis of the reclosable fastener for pressing the molten material into the pockets in the clamps. Preferably the heated knife comprises a two-piece knife, and after said transverse movement each piece of the knife is parallel to the axis of the strips in opposite directions for pressing the molten material into the pockets in the respective clamps concurrently to form adjacent end stops.

Reference is now made to the accompanying drawings, in which:

Fig. 1 is a perspective view showing apparatus for performing the method according to the invention; and

Fig. 2 is a perspective view showing other apparatus for performing the method according to

the invention.

Referring to Figs. 1, there is illustrated a thermoplastic bag B having a fastener structure comprising plastic slider 10 and a profiled plastic reclosable fastener or zipper 11 with end stops 30.

In Fig. 1 the slider 10 has been illustrated at the left hand end of the zipper 11 which is the closed end. right hand end of the zipper 11 which is the open end of the zipper also has an end stop 30 which is shown on the adjacent bag B, in Fig. 1. In opening and closing the zipper 11 it will be understood that the slider 10 will move from the closed end in Fig. 1 to the opened end vice versa.

The bag B may be made from any suitable thermoplastic film such for example as polyethylene or polypropylene or equivalent material. The bag B comprises a pair of flexible plastic sheets 12 and 13 joined at the bottom and having a top edge, with a pair of flexible plastic strips 14 end 15 of the fastener 11 extending along the length of said top edge. The strips 14 end 15 are provided with reclosable interlocking male and female profile elements in the form of rib and groove elements 16 and 17.

The strips 14 and 15 may be extruded separately and attached to the respective sides of the bag mouth; or the strips 14 and 15 may be extruded integrally with the sides of the bag mouth. The strips 14 and 15 include profiled tracks 18 and 19 extending along the length thereof and parallel to the rib and groove elements 16 and 17; and the rib end groove elements 16 and 17 preferably have a complimentary cross-sectional shape such that they are closed by pressing the bottom of the elements together first and then rolling the elements to a closed position toward the top thereof. The cross-sectional shapes of the interlocking male and female elements having the rib and groove profiles 16 and 17 are disclosed in WO 91/13564.

It is to be understood that the present invention is not limited to the shapes of the rib end groove profiles illustrated herein and that other shapes can be utilized in connection with the present invention. It is also to be understood that the present invention is not limited to the particular construction of the slider 10 disclosed herein and that other zipper sliders may be utilized in connection with the present invention.

The slider 10 straddles the zipper 11 at the top of the bag B and is adapted for opening and closing the reclosable fastener elements 16 and 17 of the zipper 11. The slider 10 is formed from a single piece of moulded plastic comprising a separator finger 9 and interlocking complimentary structure moving along the zipper 11. The separator finger 9 cooperates with the zipper 11 in such a manner as to provide a self-locking feature for the slider and, thereby, a leakproof bag.

This construction is described in more detail in US-A-5067208; the slider can have exactly the same structure as that described in this US patent. The slider 10 may be moulded from any suitable plastic such for example as nylon, polypropylene, polystyrene, Delrin or ABS.

As pointed out above the opposite ends of the zipper 11 are provided with end stops 30. Each of the end stops 30 is formed from the material at the opposite ends of the zipper 11 and protrude therefrom a distance adequate to engage the ends of the slider 10 and to prevent it from going past the respective ends of the zipper 11 and coming off the bag B.

One method of producing the end stops 30 on the zipper 11 is illustrated in Fig. 1. Two clamps 40 and 41 are adapted to grip the strips 14 and 15 therebetween. It will be noted that each half of the clamp 40 includes a cavity 40a, 40b that is adapted for alignment with the profile portion of the strips 14 and 15: the profile portion includes the rib and groove elements 16 end 17 on the strips 14 end 15. Similarly, the clamp 41 includes two halves each having a cavity or pocket 41a and 41b respectively adapted for alignment with the profile portion of the strips 14 and 15.

To clamp the profile portion of the strips 14 and 15 between the clamps 40 and 41 the sections of the clamps 40 and 41 are moved in the direction a-a indicated by the arrows. The direction a-a is transverse to the axis of the zipper 11. A hot knife 45 is positioned above the profile prtion of the strips 14 and 15, and is adapted to be plunged downwardly into the profile, cutting it apart: the inclined faces of the blade of the knife 45 force the molten material from the profile portion into the respective pockets 40a, 40b in clamp 40 and pockets 41a, 41b in clamp 41. The downward vertical movement of the knife 45 is indicated by the arrow c.

The knife 45 may be heated in any suitable manner such, for example, as an electrical heating element 45a housed within the knife 45. The knife 45 is adapted for vertical reciprocation transverse to the axis of the zipper 11 as indicated by the arrows c, d in Fig. 1. When the hot knife 45 is plunged into the profile portion of the strips 14 and 15, the heat from the knife 45 causes the material of the strips 14 and 15 to become molten so that it will be forced into the pockets 40a, 40b, 41a, 41b in the clamps 40 and 41 by the inclined faces of the knife blade. This operation fuses together the two elements 16 and 17 of the strips 14 and 15 into a unitary mass sufficiently strong to provide end stops 30 on the zipper 11 and also provides a leakproof seal at the ends of the zipper.

After the end stops 30 have been formed on the zipper 11 the hot knife 45 is retracted upwardly

in the direction of the arrow d and the clamps 40 and 41 are moved out of engagement with the zipper 11 as indicated by the arrows b-b.

The knife 45, in cooperation with the clamp 40, forms the end seal 30 at the end of one zipper 11; and the knife 45 concurrently forms an end stop 30 at the opposite end of the adjacent zipper 11 by its cooperation with the clamp 41. It will also be noted that the formation of the end stops 30 by the method disclosed in Fig. 1 leaves a separation in the zipper 11 where a side-sealing bar (not shown) can subsequently cut apart the bags along the line 43 in completing the formation of the individual bags B.

Referring to Fig. 2 there is illustrated an alternative apparatus for practicing the method according to the present invention. The corresponding parts of the slider 10, zipper 11 and bag B have been provided with the same reference characters and the end stops identified as 30'.

Different reference characters have been applied to the apparatus: two clamps 50 and 51 are adapted to grip the strips 14 and 15 therebetween; the clamp 50 includes two halves each having a cavity or pocket 50a, 50b that is adapted for alignment with the profile portion of the strips 14 and 15; the clamp 51 includes two halves each having a cavity or pocket 51a or 51b that is adapted for alignment with the profile portion of the strips 14 and 15. To clamp the profile portion of the strips 14 and 15 between the clamps 50, 51 the sections of the clamps 50 and 51 are moved in the direction a-a indicated by the arrows. The direction a-a is transverse to the axis of the zipper 11.

A hot knife 55 comprising two pieces 55a end 55b is positioned above the profile of the zipper 11 and is adapted to be plunged downwardly as indicated by the arrow c into the profile portion of the strips 14 and 15 cutting it apart. The two-piece knife 55 melts into the profile portion and then the two knife pieces 55a end 55b are moved apart as indicated by the horizontal arrows e-e in Fig. 2 to press the molten material from the profile into the respective pockets 50a end 50b in clamp 50, and 51a and 51b in clamp 51. Each half 55a end 55b of the knife 55 may be heated in any suitable manner such as an electrical heating element 56 housed within each half 55a, 55b of the knife 55.

The knife 55 is adapted for vertical reciprocation transverse to the axis of the zipper 11 as indicated by the vertical arrows c-d in Fig. 2; each piece 55a end 55b of the knife 55 moves parallel to the axis of the zipper 11 as indicated by the transverse arrows e-f. The knife piece 55a moves to the right in the direction of arrow e to force the molten material from the profile portion into the pockets 50a and 50b in clamp 50; and the knife half 55b moves to the left in the direction of the arrow e to force the molten material from the profile portion into the respective pockets 51a and 51b in clamp 51.

After the end stops 30' have been formed on the zipper 11, the knife halves 55a end 55b are moved together as indicated by the arrows f-f to the position shown in Fig. 2. The knife 55 is then retracted upwardly in the direction of the arrow d and the clamps 50 and 51 are moved out of engagement with the zipper 11 as indicated by the arrows b-b.

With the apparatus illustrated in Fig. 2 it is believed that the end stops 30' produced by this operation will be smoother than the end stops 30 produced with the apparatus in Fig. 1 since there is less sideways movement of the knife 55 relative to the clamps 50 and 51 than there is in the apparatus illustrated in Fig. 1 with movement of the knife 45 relative to the clamps 40 and 41.

The operation of the apparatus in Fig. 2 fuses together the two elements 16 and 17 of the zipper 11 to form a unitary mass sufficiently strong to provide end stops 30' on the zipper 11 and, thereby, to provide a leakproof seal at the ends of the zipper 11.

The knife 55 cooperates with the end clamp 50 to form the end stop 30' at one end of the zipper 11 and concurrently forms an end stop 30' at the opposite end of the adjacent zipper 11 by cooperation of the knife 55 with the clamp 51.

It will also be noted that the formation of the end stops 30' by the method disclosed in Fig. 2 leaves a separation in the zipper 11 where a side-sealing bar can subsequently cut apart the bags along the line 53 in completing the formation of the individual bags B.

The method disclosed in the present application for forming the end stops on the zipper has an advantage over a method utilizing ultrasonic smashing of the zipper profile in that the present method does not slow down the bag manufacturing process. It will be understood that in the manufacture of thermoplastic bags various operations are performed at various stations and since it is a continuous process it is desirable that the various steps taken at the various stations be more or less performed in corresponding lengths of time. When the end stops are produced by ultrasonic smashing, this operation requires a rather long cycle time thus slowing down the entire manufacturing process. The present method also has the additional advantage that strong bonds are formed between the zipper elements by the hot knife technique disclosed herein and at the same time well-defined end stops are formed.

While a preferred embodiment of the invention has been described and illustrated, it is to be understood that further modifications thereof may

be made within the scope of the appended claims

Claims

1. A method of making an end stop for a slider of a fastener structure for a thermoplastic bag comprising a pair of flexible plastic strips adapted to be connected to the walls of the bag and having reclosable interlocking male and female profile elements on the respective strips and a slider straddling the strips for opening and closing the fastener said strips,

   said method comprising:

   clamping together a pair of the flexible plastic strips between clamps at a seal area in a region intended to form an end of the strips, the clamps having pockets therein adjacent the profile elements at the seal area;

   severing and heating the profile elements at the seal area with a heated knife to transform the severed ends of the profile elements into molten material and pressing the molten material into the pockets in the clamps with the heated knife thereby increasing the thickness of an area of the strips adjacent the seal area to provide a protruding end stop for preventing movement of the slider past the ends of the bag.

2. A method according to claim 1, wherein the pair of flexible plastic strips is clamped between at least one pair of clamps.

3. A method according to claim 2, wherein the pair of flexible strips is clamped between two pairs of clamps.

4. A method according to claim 2 or 3, wherein the heated knife is moved transversely to the axis of the strips in severing the profile elements.

5. A method according to claim 4, wherein the heated knife has at least one inclined surface for pressing the molten material into the pockets in the clamps.

6. A method according to claim 5, the heated knife has two inclined surfaces for pressing the molten material into the pockets in each of the clamps concurrently to form adjacent end stops.

7. A method according to claim 4, wherein the heated knife is thereafter moved parallel to the axis of the reclosable fastener for pressing the molten material into the pockets in the clamps.

8. A method according to claim 4, wherein the heated knife comprises a two-piece knife, and after said transverse movement each piece of the knife is moved parallel to the axis of the strips in opposite directions for pressing the molten material into the pockets in the respective clamps concurrently to form adjacent end stops.

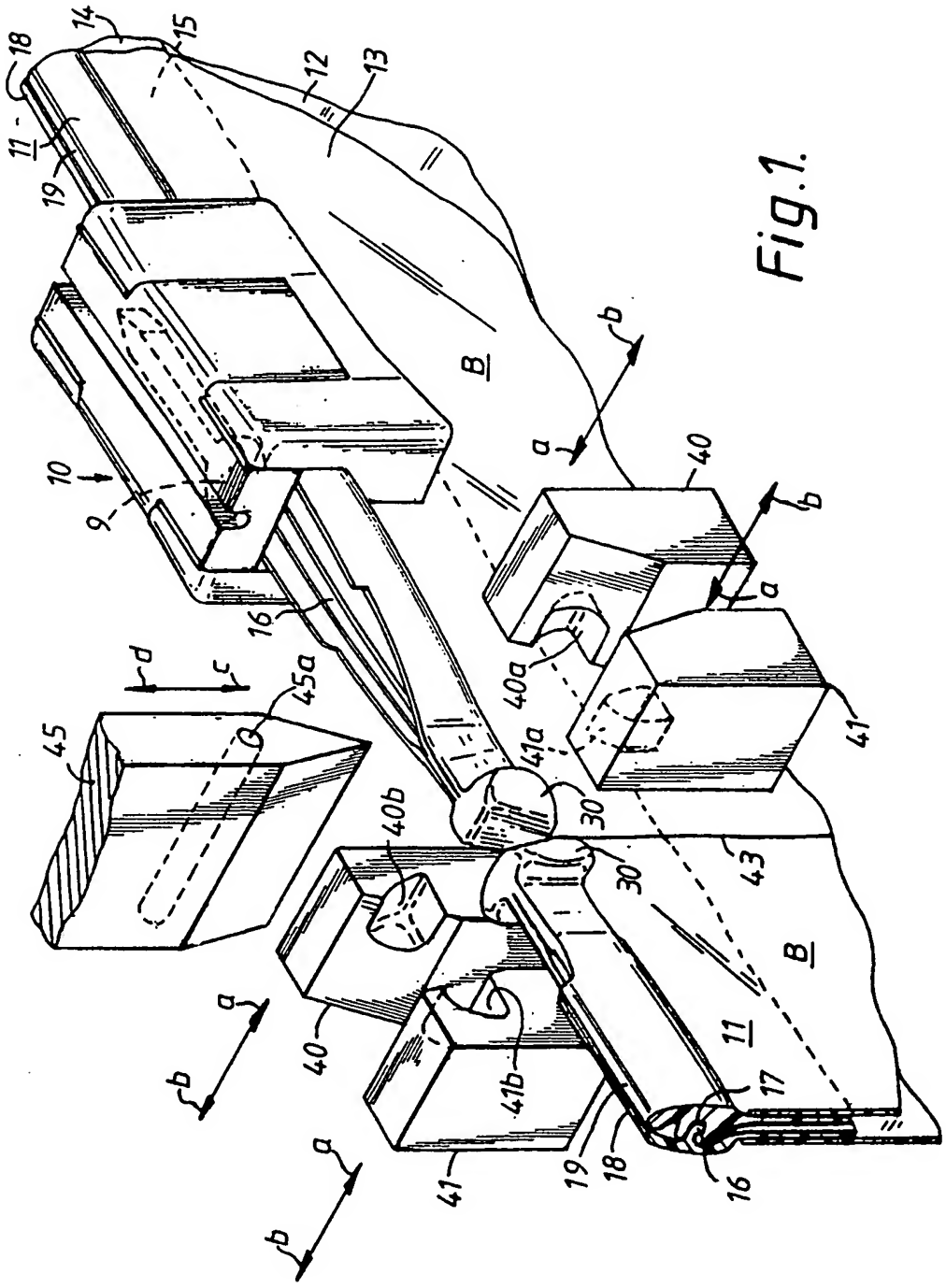

Fig.1.

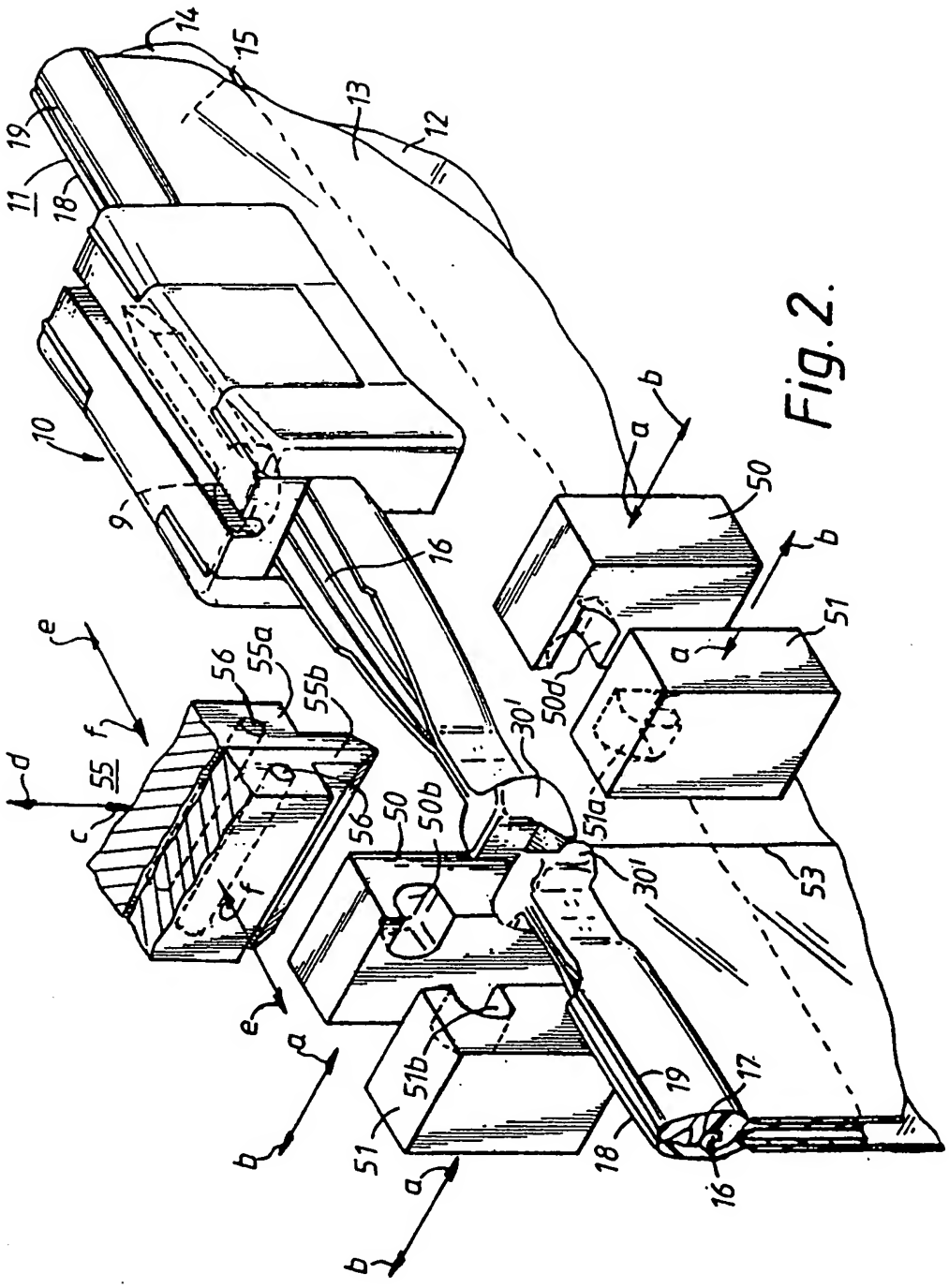

Fig. 2.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 30 1874

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A,D	US-A-3 790 992 (MINIGRIP INC.) * column 2, line 7 - column 3, line 50; figures 1-5 *	1	A44B19/36 A44B19/16 B29C65/74
A	WO-A-8 702 968 (KCL CORPORATION) * page 6, paragraph 3 - page 7, paragraph 1 * * page 14, paragraph 3 - page 15, paragraph 1; figures 1,4,5 *	1	
A	FR-A-2 409 719 (YOSHIDA KOGYO K. K.)		
A	US-A-3 986 914 (H. KEITH HOWARD)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A44B
B65D
B29D
B21D
B31B
B29C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24 JUNE 1992	GARNIER F.M.A.C.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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